

Appl. No. 10/024,164

Amdt. Dated 3 January 2005

Reply to Office action of 4 October 2004

AMENDMENTS TO THE CLAIMS

Please substitute the following claims for the respective claims previously existing in this application.

1. (Currently amended) A method of fabricating a cathode using electrophoretic deposition comprising the steps of:

providing a substrate;

providing a solvent, having a solute comprised of dissolved metal ions disposed therein, the solvent and solute forming a binder solution;

immersing the substrate into the binder solution;

applying a voltage to the immersed substrate, the application of the voltage providing for in situ formation of a binder material as a product of the reaction of the binder solution to the applied voltage and electrophoretic deposition of a the binder material to the immersed substrate, thereby forming a layer of binder material on the immersed substrate;

removing the substrate having the layer of binder material formed thereon from the binder solution;

providing a suspension bath consisting of a colloidal solution of an alcohol and a plurality of emitting structures;

immersing the substrate having the layer of binder material formed thereon, into the suspension bath;

removing the substrate from the suspension bath; and

thermal processing of the removed substrate to form adhesion properties.

2. (Previously presented) A method of fabricating a cathode using electrophoretic deposition as claimed in claim 1 wherein the step of providing a substrate, includes providing a substrate having a plurality of patterned metal electrodes formed thereon a surface of the substrate.

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3. (Currently amended) A method of fabricating a cathode using electrophoretic deposition as claimed in claim 1 wherein the providing a solvent, ~~having a solute disposed therein~~, includes the step of providing at least one of an alcohol, a water, or a glycerin solvent; ~~having a solute salt disposed therein~~.

4. (Previously presented) A method of fabricating a cathode using electrophoretic deposition as claimed in claim 3 wherein the binder material is magnesium hydroxide ($Mg(OH)_2$).

5. (Currently amended) A method of fabricating a cathode using electrophoretic deposition as claimed in claim 3 wherein the step of providing a suspension bath ~~consisting of a colloidal solution of an alcohol and a plurality of emitting structures~~ includes providing the a colloidal solution comprising of carbon nanotubes suspended in isopropyl alcohol (IPA) .

6. (Cancelled)

7. (Previously presented) A method of fabricating a cathode using electrophoretic deposition as claimed in claim 5 wherein the step of immersing the substrate having the binder material formed thereon, into the colloidal solution of an alcohol and a plurality of emitting structures further includes the step of applying a bias to the suspension bath, thereby providing for the migration and binding of the emitting structures to the layer of binder material.

8. (Currently amended) A method of fabricating a cathode using electrophoretic deposition as claimed in claim 1 wherein the step of thermal processing the substrate to form adhesion properties, further includes the formation of a plurality of micro-islands in the binder layer defined by a plurality of edges, the plurality of micro-islands having the ~~the~~ ^{[[a]]} plurality of emitting structures embedded in the micro-islands and protruding from the edges.

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9. (Previously presented) A method of fabricating a cathode using electrophoretic deposition comprising the steps of:

providing a substrate having a plurality of metal electrodes formed thereon;

providing a binder solution including a solvent and a solute salt comprised of dissolved metal ions;

immersing the substrate into the binder solution;

applying a voltage to the immersed substrate thereby forming in situ a binder material as a product of the binder solution and the applied voltage;

electrophoretically depositing the binder material formed in situ on a surface of the immersed substrate, thereby forming a layer of binder material on the plurality of metal electrodes formed thereon the substrate;

providing a suspension bath consisting of a colloidal solution of an alcohol and a plurality of carbon nanotubes;

immersing the substrate having the layer of binder material formed thereon, into the suspension bath consisting of a colloidal solution of an alcohol and a plurality of carbon nanotubes;

removing the substrate from the suspension bath; and

thermal processing of the substrate to form adhesion properties in the binder layer and form micro-islands defined by a plurality of edges, and having carbon nanotubes protruding from the edges of the micro-islands.

10. (Currently amended) A method of fabricating a cathode using electrophoretic deposition as claimed in claim 9 wherein the step of providing a solvent, ~~having a solute disposed therein~~, includes the step of providing at least one of an alcohol, a water, or a glycerin solvent, ~~having a solute salt disposed therein~~.

11. (Previously presented) A method of fabricating a cathode using electrophoretic deposition as claimed in claim 10 wherein the alcohol is one of methanol, ethanol, or isopropyl alcohol (IPA).

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12. (Cancelled)

13. (Currently amended) A method of fabricating a cathode using electrophoretic deposition as claimed in claim 12 wherein the binder material is magnesium hydroxide ($\text{Mg}(\text{OH})_2$).

14. (Currently amended) A method of fabricating a cathode using electrophoretic deposition as claimed in claim 12 wherein the step of providing a suspension bath ~~consisting of a colloidal solution of an alcohol and a plurality of carbon nanotubes~~ includes the step of providing a colloidal solution of carbon nanotubes suspended in an alcohol solvent.

15. (Cancelled)

16. (Previously presented) A method of fabricating a cathode using electrophoretic deposition as claimed in claim 12 wherein the step of immersing the substrate having the binder material formed thereon, into the suspension bath further includes the step of applying a bias to the suspension bath, thereby providing for the migration and binding of the carbon nanotubes to the layer of binder material.

Claims 17-20 (cancelled)

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21. (New) A method of fabricating a cathode using electrophoretic deposition comprising the steps of:

providing a substrate;

providing a solvent, having a solute comprised of dissolved metal ions disposed therein, the solvent and solute forming a binder solution;

immersing the substrate into the binder solution;

applying a voltage to the immersed substrate, the application of the voltage providing for in situ formation of a binder material as a product of the reaction of the binder solution to the applied voltage and electrophoretic deposition of a the binder material to the immersed substrate, thereby forming a layer of binder material on the immersed substrate;

removing the substrate having the layer of binder material formed thereon from the binder solution;

providing a suspension bath consisting of a colloidal solution of an alcohol, a dispersion agent, and a plurality of emitting structures;

immersing the substrate having the layer of binder material formed thereon, into the suspension bath;

removing the substrate from the suspension bath; and

thermal processing of the removed substrate to form adhesion properties.

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22. (New) A method of fabricating a cathode using electrophoretic deposition comprising the steps of:

- providing a substrate having a plurality of metal electrodes formed thereon;
- providing a binder solution including a solvent and a solute salt comprised of dissolved metal ions;
- immersing the substrate into the binder solution;
- applying a voltage to the immersed substrate thereby forming in situ a binder material as a product of the binder solution and the applied voltage;
- electrophoretically depositing the binder material formed in situ on a surface of the immersed substrate, thereby forming a layer of binder material on the plurality of metal electrodes formed thereon the substrate;
- providing a suspension bath consisting of a colloidal solution of an alcohol, a dispersion agent, and a plurality of carbon nanotubes;
- immersing the substrate having the layer of binder material formed thereon, into the suspension bath consisting of a colloidal solution of an alcohol and a plurality of carbon nanotubes;
- removing the substrate from the suspension bath; and
- thermal processing of the substrate to form adhesion properties in the binder layer and form micro-islands defined by a plurality of edges, and having carbon nanotubes protruding from the edges of the micro-islands.

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23. (New) A method of fabricating a cathode using electrophoretic deposition comprising:

providing a substrate;

immersing the substrate into a binder solution comprising a solvent and a solute of dissolved metal ions;

applying a voltage to the substrate immersed in the binder solution, thereby forming a binder material on the substrate;

removing the substrate from the binder solution;

immersing the substrate having the binder material formed thereon into a suspension bath comprising a colloidal solution of an alcohol and a plurality of emitting structures;

applying a voltage to the substrate immersed in the suspension bath, wherein at least some of the plurality of emitting structures adhere to the binder material;

removing the substrate from the suspension bath; and

heating the substrate removed from the suspension bath to form micro-islands of emitting structures.